

Appl. No. 09/889,088
Amendment and/or Response
Reply to Office action of 23 March 2004

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Amendments to the Claims:

A listing of the entire set of pending claims (including amendments to the claims, if any) is submitted herewith per 37 CFR 1.121. This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

1. (Currently amended) A liquid crystal display apparatus capable of color-displaying ~~provided with comprising:~~

a crystal panel having, in each main pixel unit, a red outputting subpixel, a green outputting subpixel, a blue outputting subpixel, and a luminance-intensifying subpixel, ~~and characterized by comprising: data calculating means for obtaining~~
a decoder that is configured to provide a digital value for driving ~~a-the~~ luminance-intensifying subpixel by carrying out a predetermined calculation processing using digital values respectively for a red inputting pixel, a green inputting pixel, and a blue inputting pixel which are obtained from an input image,

wherein:

~~said-the~~ liquid crystal displaying apparatus driving the luminance-intensifying subpixel, the red outputting subpixel, the green outputting subpixel and the blue outputting subpixel by using ~~said-the~~ digital value for driving ~~said-the~~ luminance-intensifying subpixel obtained by ~~said-data-calculating-means~~ the decoder and ~~said-the~~ digital values of ~~said-the~~ red, green and blue inputting subpixels, ~~characterized in that: and~~

~~said-the~~ predetermined calculation processing by ~~said-data-calculating-means~~ obtains ~~said-the~~ digital value for driving ~~said-the~~ luminance-intensifying subpixel by a function of $W=f(Y_{min}, Y_{max})$ where ~~said-the~~ digital value of ~~said-the~~ luminance-intensifying pixel is defined as W , and a minimum value and a maximum value of ~~said-the~~ digital values of ~~said-the~~ red inputting subpixel, ~~said-the~~ green inputting subpixel and ~~said-the~~ blue inputting subpixel are respectively defined as Y_{min} and Y_{max} , ~~and~~ the function $f(Y_{min}, Y_{max})$ provides an output value that is dependent upon both Y_{min} and Y_{max} .

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2. (Currently amended) A liquid crystal display apparatus according to ~~Claim 2 claim~~ 1, wherein ~~said the~~ function of $W=f(Y_{min}, Y_{max})$ is directed to a function which is ~~monotonously increased that monotonically increases~~ as said Y_{min} value or said Y_{max} value ~~becomes larger~~ increases.

3. (Canceled)

4. (Currently amended) A liquid crystal display apparatus according to ~~claim 4~~ characterized in that: when capable of color-displaying comprising:

a crystal panel having, in each main pixel unit, a red outputting subpixel, a green outputting subpixel, a blue outputting subpixel, and a luminance-intensifying subpixel, and

a decoder that is configured to obtain a digital value for driving the luminance-intensifying subpixel by carrying out a predetermined calculation processing using digital values respectively for a red inputting pixel, a green inputting pixel, and a blue inputting pixel which are obtained from an input image,

wherein:

the liquid crystal displaying apparatus driving the luminance-intensifying subpixel, the red outputting subpixel, the green outputting subpixel and the blue outputting subpixel by using the digital value for driving the luminance-intensifying subpixel obtained by the decoder and the digital values of the red, green and blue inputting subpixels, and

the predetermined calculation processing by decoder provides the digital value for driving the luminance-intensifying subpixel by a function of $W=f(Y_{min}, \alpha, \beta, n)$ where the digital value of the luminance-intensifying pixel is defined as W , and a minimum value of the digital values of the red inputting subpixel, the green inputting subpixel and the blue inputting subpixel is defined as Y_{min} , and α , β and n are predetermined real numbers, at least one of α and β being non-zero, and when

a maximum value which digital values of said the red inputting subpixel, said the green inputting subpixel and said the blue inputting subpixel can take is defined as MAX , and said the function of $W=f(Y_{min}, \alpha, \beta, n)$ ~~$w=f(Y_{min}, Y_{max})$~~ is represented

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by a function of $W = \text{Max}\{(Y_{\text{min}} + \alpha) / (\text{MAX} + \beta)\}^n$ ~~$W = \text{Max}\{(Y_{\text{min}} + \alpha) + (\text{MAX} + \beta)\}^n$~~ by which a digital value for driving said luminance intensifying subpixel is obtained.

5. (Canceled)

6. (Currently amended) A liquid crystal display apparatus according to claim 1, further including: characterized in that: said apparatus comprises: storing means for storing a memory that is configured to store a plurality of kinds of functions each represented by said the function of $W = f(Y_{\text{min}}, Y_{\text{max}})$; and selecting means for selecting a selector that is configured to select from among the any of said plurality of kinds of functions represented by said the function of $W = f(Y_{\text{min}}, Y_{\text{max}})$ stored by said storing means the memory.

7. (Currently amended) A liquid crystal display apparatus according to claim 1, wherein said the red outputting subpixel, said the green outputting subpixel and said the blue outputting subpixel are arranged to form a main pixel unit without using said the luminance-intensifying subpixel for luminance In accordance with a predetermined control signal, ~~thereby to enable the apparatus to be used as a liquid crystal display apparatus capable of color displaying.~~

8. (Canceled)

9. (New) A liquid crystal display apparatus according to claim 1, wherein the function $W = f(Y_{\text{min}}, Y_{\text{max}})$ is given as a function $W = (Y_{\text{max}} * Y_{\text{min}}) / \text{MAX}^2$, where MAX is a maximum value which digital values of the red inputting subpixel, the green inputting subpixel and the blue inputting subpixel can take.

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10. (New) A liquid crystal display apparatus according to claim 9, further including
a memory that is configured to store at least one other function for determining
W, and
a selector that is configured to select among the functions for determining W
stored by the memory.

11. (New) A liquid crystal display apparatus according to claim 10, wherein
the at least one other function includes $W = \text{Max}\{((Y_{\text{min}} + \alpha) / (\text{MAX} + \beta))^n\}$, where
MAX is a maximum value which digital values of the red inputting subpixel, the green
inputting subpixel and the blue inputting subpixel can take.

12. (New) A liquid crystal display apparatus according to claim 9, wherein
the decoder is further configured to:
receive a control signal, and
selectively provide the digital value for driving the luminance-
intensifying subpixel based on the control signal.

13. (New) A liquid crystal display apparatus according to claim 10, wherein
the decoder is further configured to:
receive a control signal, and
selectively provide the digital value for driving the luminance-
intensifying subpixel based on the control signal.

14. (New) A liquid crystal display apparatus according to claim 1, further including
a memory that is configured to store at least one other function for determining
W, and
a selector that is configured to select among the functions for determining W
stored by the memory.

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15. (New) A liquid crystal display apparatus according to claim 14, wherein
the at least one other function includes $W = \text{Max}\{(Y_{\text{min}} + \alpha) / (\text{MAX} + \beta)\}^n$, where
MAX is a maximum value which digital values of the red inputting subpixel, the green
inputting subpixel and the blue inputting subpixel can take.

16. (New) A liquid crystal display apparatus according to claim 1, wherein
the decoder is further configured to:
receive a control signal, and
selectively provide the digital value for driving the luminance-
intensifying subpixel based on the control signal.

17. (New) A liquid crystal display apparatus according to claim 4, further including
a memory that is configured to store at least one other function for determining
W, and
a selector that is configured to select among the functions for determining W
stored by the memory.

18. (New) A liquid crystal display apparatus according to claim 17, wherein
the at least one other function includes $W = (Y_{\text{max}} * Y_{\text{min}}) / \text{MAX}^2$.

19. (New) A liquid crystal display apparatus according to claim 18, wherein
the decoder is further configured to:
receive a control signal, and
selectively provide the digital value for driving the luminance-
intensifying subpixel based on the control signal.

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20. (New) A liquid crystal display apparatus according to claim 17, wherein
the decoder is further configured to:
receive a control signal, and
selectively provide the digital value for driving the luminance-
intensifying subpixel based on the control signal.

21. (New) A liquid crystal display apparatus according to claim 4, wherein
the decoder is further configured to:
receive a control signal, and
selectively provide the digital value for driving the luminance-
intensifying subpixel based on the control signal.